What is claimed is:

1. A semiconductor device comprising:

a semiconductor substrate;

a first insulating film formed on the semiconductor substrate so that a contact face between the first insulating film and the substrate has two first edges that run in parallel with each other;

a conductive film formed on the first insulating film so that a contact face between the conductive film and the first insulating film has two second edges that run in parallel with the first edges;

a nitrogen-containing silicon oxide film having a first face that is in contact with side faces of the first insulating film defined by the first edges, side faces of the conductive film defined by the second edges, and surface areas of the semiconductor substrate defined by the first edges; and

a boron-doped phosphorus silicate glass (BPSG) film formed over the conductive film and on a second face, which is opposite to the first face, of the nitrogen-containing silicon oxide film.

2. The semiconductor device of claim 1, further comprising:

a second insulating film formed on the conductive film so that a contact face between the second insulating film and the conductive film has two third edges that run in parallel with the first edges.

3. The semiconductor device of claim 1, wherein the nitrogen-containing silicon oxide film has a peak in a nitrogen concentration distribution in a thickness direction.

4. The semiconductor device of claim 3, wherein the peak is 2 atm% or above.

5. The semiconductor device of claim 3, wherein the peak is 4 atm% or above.

6. The semiconductor device of claim 1, wherein the conductive film has a multilayer structure consisting of:

a first conductive film made of polysilicon or polycrystalline silicon; and

a second conductive film made of refractory metal or a silicide of refractory metal, formed on the first conductive film.

7. The semiconductor device of claim 1, wherein the conductive film has a multilayer structure consisting of:

a lower conductive film;

a third insulating film formed on the lower conductive film; and

an upper conductive film formed on the third insulating film.

8. The semiconductor device of claim 7, wherein the upper conductive film has a multilayer structure consisting of:

a first conductive film made of polysilicon or polycrystalline silicon; and

a second conductive film made of refractory metal or a silicide of refractory metal, formed on the first conductive film.

9. The semiconductor device of claim 2, wherein the nitrogen-containing silicon oxide film covers the top and side faces of the second insulating film.

10. The semiconductor device of claim 2, wherein the second insulating film is made of silicon oxide or silicon nitride.

11. The semiconductor device of claim 2, wherein:

the second insulating film is made of silicon nitride; and

the BPSG film covers the top and side faces of the second insulating film.

12. The semiconductor device of claim 1, wherein the semiconductor substrate has:

a first semiconductor region of a first conductivity type, including the contact face between the first insulating film and the semiconductor substrate;

a second semiconductor region of a second conductivity type, formed in a surface area of the semiconductor substrate that involves one of the first edges and is in contact with the first semiconductor region; and

a third semiconductor region of the second conductivity type, formed in a surface area of the semiconductor substrate that involves the other of the first edges and is in contact with the first semiconductor region.

13. The semiconductor device of claim 12, wherein the semiconductor substrate further has:

a fourth semiconductor region of the second conductivity type, defined in a surface area of the semiconductor substrate and is in contact with the first and second semiconductor

regions; and

a fifth semiconductor region of the second conductivity type, defined in a surface area of the semiconductor substrate and is in contact with the first and third semiconductor regions.

14. The semiconductor device of claim 12, further comprising:

a first conductor that is in contact with the second semiconductor region and extends through the nitrogen-containing silicon oxide film and BPSG film; and

a second conductor that is in contact with the third semiconductor region and extends through the nitrogen-containing silicon oxide film and BPSG film.

15. The semiconductor device of claim 12, further comprising:

a first insulator that is buried in the surface of the semiconductor substrate, surrounds the second and third semiconductor regions, and has a bottom that is in contact with the first semiconductor region.

16. The semiconductor device of claim 12, further comprising:

a third insulator having a first face that is in contact with the nitrogen-containing silicon oxide film and a second face that confronts the side faces of the conductive film and surface areas of the semiconductor substrate defined by the first edges.

17. The semiconductor device of claim 16, wherein:

the first face of the third insulator is identical with the second face of the third insulator.

18. A method of manufacturing a semiconductor device, comprising the steps of:

forming an insulating film on a semiconductor substrate;

forming a conductive film on the insulating film;

forming a nitrogen-containing oxide film over the semiconductor substrate, insulating film, and conductive film;

forming a boron-doped phosphorus silicate glass (BPSG) film after the nitrogen-containing oxide film; and

carrying out a heat treatment on the BPSG film in an oxidizing atmosphere.

19. The method of claim 18, wherein the step of forming a nitrogen-containing oxide film includes the step of carrying out a heat treatment in a dinitrogen monoxide (N_2O)

gas.

20. The method of claim 18, wherein the step of forming a nitrogen-containing oxide film includes the steps of:

forming a thermal oxide film on exposed surfaces of the semiconductor substrate and conductive film; and

heat-treating the thermal oxide film in a dinitrogen monoxide (N_2O) gas or a nitric monoxide (NO) gas.

21. The method of claim 18, wherein the step of forming a nitrogen-containing oxide film includes the steps of:

forming a silicon oxide film on exposed surfaces of the semiconductor substrate, insulating film, and conductive film; and

heat-treating the silicon oxide film in a dinitrogen monoxide (N_2O) gas or a nitric monoxide (NO) gas.

22. The method of claim 18, wherein the oxidizing atmosphere contains water vapor.